T-4087

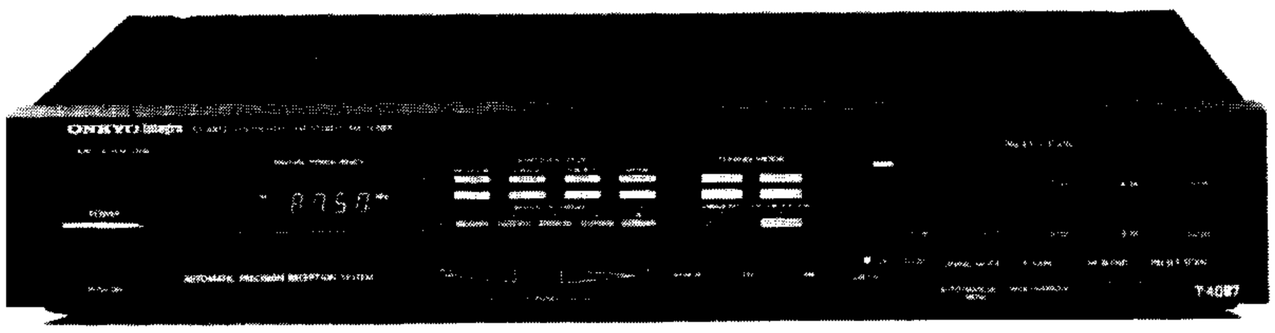
SERIAL No. 3219

ONKYO SERVICE MANUAL

SYNTHESIZED

FM STEREO/AM TUNER

MODEL T-4087



Silver and black models

UD, UDN, BUD, BUDN	120V AC, 60Hz
UG, BUG	220V AC, 50Hz
UW, BUW	120 or 220V AC, 50/60Hz
UQA, UQB	240V AC, 50Hz

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK ⚠ ON THE SCHEMATIC DIAGRAM AND IN THE PARTS LIST ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE THESE COMPONENTS WITH ONKYO PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL.

MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

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ONKYO
AUDIO COMPONENTS

SPECIFICATIONS

FM:

Tuning Range:	87.9 – 107.5 MHz (200kHz steps) (D) 87.50 – 108.00 MHz (50kHz steps) (G/W)
Usable Sensitivity:	Mono: 10.3dBf, 0.9μV, IHF (75Ω) Stereo: 17.2dBf, 2.0μV
50dB Quieting Sensitivity:	Mono: 16.0dBf, 1.7μV Stereo: 36.0dBf, 17μV
Capture Ratio:	1.0dB
Image Rejection Ratio:	100dB
IF Rejection Ratio:	100dB
Signal-to-Noise Ratio:	Mono: 85dB Stereo: 77dB
Alternate Channel Attenuation:	80dB IHF (±400kHz) (Narrow) (D)
Selectivity:	80dB DIN (Narrow) (±300kHz, 40kHz Dev.) (G)
AM Suppression Ratio:	55dB
Total Harmonic Distortion:	Mono: 0.03% Stereo: 0.07% (wide)
Frequency Response:	30 – 15,000Hz +0.5dB/ −1.5dB
Stereo Separation:	45dB at 1kHz 33dB at 70 – 10,000Hz
Output Voltage:	0 ~ 1.5V
Muting Level:	17.2dBf, 4.0μV

AM:

Tuning Range:	522 – 1611kHz (9kHz steps) (G) 530 – 1610kHz (10kHz steps) (D)
Usable Sensitivity:	25μV
Image Rejection Ratio:	40dB
IF Rejection Ratio:	40dB
Signal-to-Noise Ratio:	40dB
Total Harmonic Distortion:	0.7%
Output Voltage:	0 ~ 400mV

General

Antennas:	FM: coaxial terminal AM: built-in loop antenna and external terminal
Semiconductors:	FETs: 8 TR: 39 ICs: 20 Diodes: 96 LEDs: 31
Dimensions (WxHxD):	435 x 77 x 372mm (17-18" x 3" x 14-5/8")
Weight:	4.4kg., 9.7lbs. (G)
Dimensions (WxHxD): (with side panels)	465 x 77 x 372mm (18-3/8" x 3" x 14-5/8")
Weight: (with side panels)	5.1kg., 11.2lbs (D)

Specifications and features are subject to change without notice.

SERVICE PROCEDURES

1. Replacement of lamp

This unit is used two lamps listed below.

Circuit no.	Part no.	Description
PL001	210149	PL14V0.06AW-3.0, Power indicator
PL902	210064A	PL6.3V, 250mA, Dial plate illumination

2. Safety-check output

(Only U.S.A. model)

After correcting the original service problem, perform the following safety check before releasing the set to the customer. Connect the insulating-resistance tester between the plug of power supply cord and nickel screw on the back panel.

Specifications: 3.3Mohm ± 10% at 500V.

3. Change of band step/de-emphasis

Universal models are equipped with a band step/ de-emphasis switch on the back panel. This switch is set to following position.

	Emphasis	AM step
set position	50μsec.	9 kHz
other	75μsec.	10 kHz

4. Change of voltage

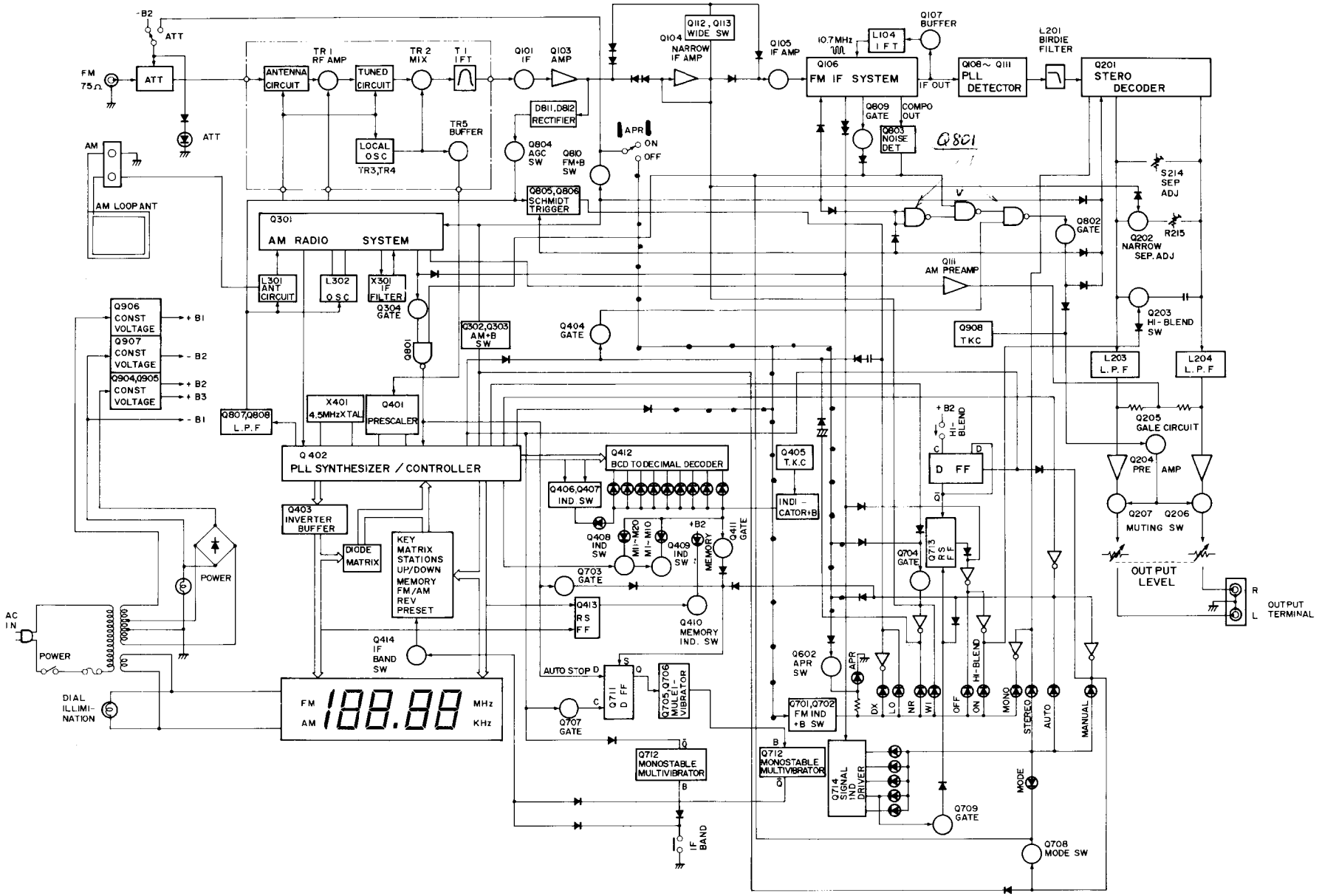
Universal models are equipped with a voltage selector to conform with local power supplies. This switch is located on the back panel. Be sure to set this switch to match the voltage of the power supply in your area before tuning the power switch on.

This switch is set to 220V at the factory. Voltage is changed by sliding the groove in the switch with the screwdriver to the right or left. Confirm that the switch has been moved all the way to the right or left before turning the power switch on.

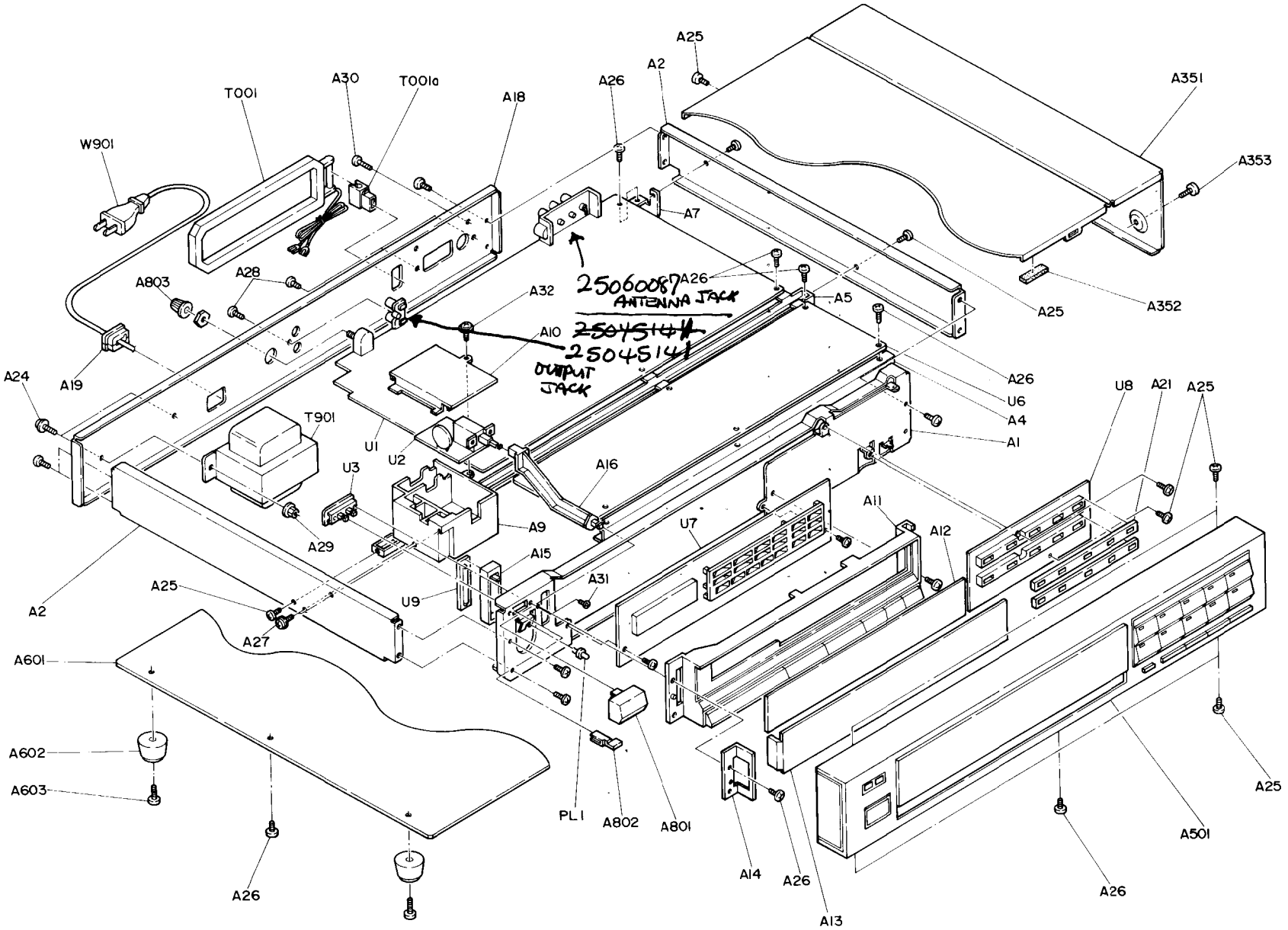
5. Memory preservation

This unit dose not require memory preservation batteries. A built-in memory power back-up system preserves contents of the memory during power failures and even when the unit is unplugged. The unit must be plugged in and the power switch turned on and off once in order to charge the super capacitor of C409. Note that since this is not a permanent memory, the power switch must be turned on and off a few times each month to keep the back-up system operable. The period of time during which memory contents are preserved after power has last been turned off varies depending on climate and the location and placement of the unit. On the average, memory contations are protected over a period of 2 weeks after the last time power has been turned off. This period is shorter when the unit exposed to very high humidity or used in an area with an extermely humid climate.

BLOCK DIAGRAM



EXPLODED VIEW



PARTS LIST

REF. NO.		PART NO.	DESCRIPTION
A1		27110242-1B	Front bracket
A2		27115014G	Side bracket
A4		27130406	Bracket F
A5		27130407A	Bracket C
A7		27141029	Bracket, pc board
A9		27190351A	Holder, power
A10		27190356	Holder, lid
A11		27190405A	Holder ass'y
A12		28133145	Back plate
A13		28130231	Dial plate
A14		27190353	Holder, dial plate
A15		27190198B	Holder, lamp
A16		27273030C	Joint L
A18		27120761	Back panel <D>
		27120762	Back panel <G>
		27120764	Back panel <W>
A19	⚠	27300750	Strainrelief
A21		28140613	Cushion
A24		838440089	4TTB+8C (BC), Tapping screw
A25		834430068	3TTS+6B (BC), Tapping screw
A26		831430088	3TTW+8B (BC), Tapping screw
A27		833430080	3TTP+8P (BC), Tapping screw
A28		834430108	3TTS+10B (BC), Tapping screw
A29		86414010	FWN4x10FN, Flange nut
A30		834230108	3TTS+10B (Ni), Nickel screw
A31		82143006	3P+6FN (BC), Pan head screw
A32		831430100	3TTW+10P (BC), Tapping screw
A33		838430068	3TTB+6B (BC), Tapping screw
A51		82143006	3P+6FN (BC), Pan head screw <W>
A52		82142604	2.6P+4F (BC), Pan head screw <W>

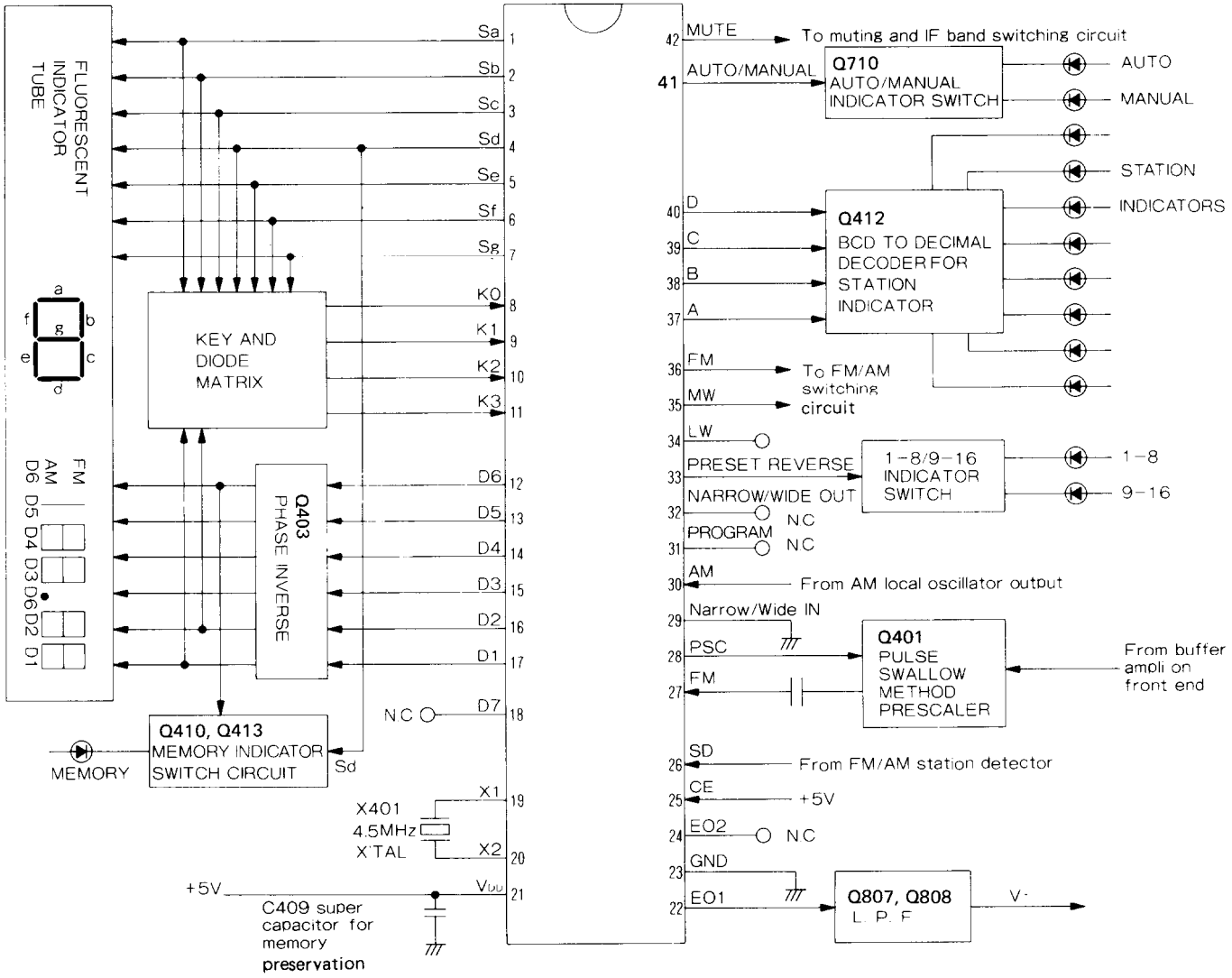
REF. NO.		PART NO.	DESCRIPTION
A351		28184188	Top cover <S>
		28184183	Top cover <B>
A352		28140020	4x10x40, Cushion
A353		838440089	4TTB+8C (BC), Tapping screw
A354		28185250	Side panel L <DN>
A355		28185251	Side panel R <DN>
A356		836440303	4STV+30CQ (BC), Special screw <DN>
A357		870086	4x12BS (BC), Special washer <DN>
A501		18568121	Front panel ass'y <S>
		18578121	Front panel ass'y <B>
		18579121	Front panel ass'y <DN> <B>
A601		27170156-1A	Bottom board
A602		27175009A	Leg
A603		834430068	3TTS+6B (BC), Tapping screw
A604		834430108	3TTS+10B (BC), Tapping screw
A605		831130088	3TTW+8B (BC), Tapping screw
A801		28321904	Knob, power <S>
		28321905	Knob, power <B>
A802		28322259	Knob A <S>
		28322260	Knob A <B>
A803		28320540	Knob L
PL001		210149	PL14V0.06AW-3.0, Lamp
S002	⚠	25065123	NSS-1258P, Voltage selector switch <W>
T001		232098	NMA-3040, AM loop antenna
T001a		27190129	Holder, antenna
T901	⚠	2300026	NPT-893D, Power transformer <D>
	⚠	2300027	NPT-893G, Power transformer <G>
	⚠	2300028	NPT-893DG, Power transformer <W>

REF. NO.		PART NO.	DESCRIPTION
U1		18568516	NARF-2416-1, Main circuit pc board ass'y <D>
		18564516A	NARF-2416-1A, Main circuit pc board ass'y <G>
		18560516-1B	NARF-2416-1B, Main circuit pc board ass'y <W>
U2		18568517	NASW-2417-1, Power switch pc board ass'y <D>
		18564517A	NASW-2417-1A, Power switch pc board ass'y <G/W>
U3		18568518	NASW-2418-1, APR/Att. switch pc board ass'y
U4		18560519-1	NASW-2419-1, Band/Emphasis switch pc ass'y <W>
U6		18568520	NADG-2420-1, Digital circuit pc board ass'y <D>
		18564520A	NADG-2420-1A, Digital circuit pc board ass'y <G>
		18560520-1B	NADG-2420-1B, Digital circuit pc board ass'y <W>
U7		18568521	NADG-2421-1, Display circuit pc board ass'y
U8		18568522	NASW-2422-1, Memory switch pc board ass'y
U9		18564523	NAPL-2423-1, Lamp pc board ass'y
W901	⚠	253112	AS-UC-4 #18, Power supply cord <D>
	⚠	253130 or 253128	AS-CEE, Power supply cord <G/W>

NOTE: THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PARTS NUMBER SPECIFIED.

NOTE: <D>: Only 120V model
<DN>: Only U. S. A. model
<G>: Only 220V model
<W>: Only Universal model
<S>: Only silver model
<B>: Only black model

MICROCOMPUTER OPERATION



Pin No.	Symbol	Terminal	Description
1 – 7	Sa – Sg	Segment outputs	Display tube signal terminal output and key return signal source terminals; active high. Since these terminals can handle 30V, they are connected directly to the segment terminals of the fluorescent display tube.
8 – 11	K0 – K3	Key return signal inputs	Terminals for input of the key return signals from external matrix circuit.
12 – 18	D1 – D7	Digit outputs	Display tube digit output signal terminals; active low. D1 and D2 are used the key return signal source.
19, 20	X1, X2	X'tal	Connect to the 4.5MHz crystal oscillator.
21	V_{DD}	Power source input	Device power source terminal; supplies 5V during normal operation and 2.5V from the super capacitor C409 for memory preservation.

Pin No.	Symbol	Terminal	Description
22, 24	E01, E02	Error outputs	Charge pump output of the phase detector with constitutes the PLL. High level is output when the divided oscillation frequency is higher than the reference frequency. In the opposite case, low level is output. Floating occures when the frequencies match. The output is applied to the variable capacitor diode in the front end through the low pass filter Q807 and Q808. The output from both terminals is same, but only E01 is used.
23	GND	Ground	
25	CE	Chip enable	Device selection signal input terminal. High level ... Normal operation Low level ... Memory preservation
26	SD	Station detector signal input	Input terminal for detecting whether or not a broadcast signal is being received during auto-tuning. Stopped by the high level.
27	FM	FM local oscillator signal input	Input terminal for FM local oscillator is divided by 1/16 or 1/17 by prescaler Q401.
28	PSC	Pulse swallow control output	This terminal outputs a signal that switches the prescaler division ratio of Q401 to 1/16 or 1/17 when the pulse swallow method is used for division. (FM only)
29	NARROW/ Wide out	IF band width output	Terminal for switching narrow and wide of IF band width. Not used.
30	AM	AM local oscillator signal input	Terminal for input of the AM local oscillator signal.
31	PROGRAM	Program selection signal output	Terminal for indicator output whether or not the program mode. Not used.
32	NARROW/ Wide out	IF band width switching output	Terminal for specifications output of IF band width. Not used.
33	Preset Reverse	Preset reverse indication output	Terminal for indication output whether M1 – M8 or M9 – M16 the preset key.
34	LW	Band switching signal outputs	Terminals for signal output switching of each band. High level is output from terminal of FM (pin no. 36) and low level is output from other terminals (pin no. 34 & 35) during FM reception. LW is not used with T-4087.
35	MW		
36	FM		
37 38 39 40	A B C D	Preset station indication outputs	Terminals for BCD code output of preset station indicator.
41	AUTO/ MANUAL	Auto/Manual indication output	Terminal for indication output whether or auto the tuning mode. This terminal becomes high during auto mode and low during manual mode.
42	MUTE	Muting output	Output terminal which mutes the shock noise occurring when the PLL is released; active high. The muting signal is output as shown below. UP/DOWN of manual/auto mode, preset memory is recalled, band switching and preset scan.

ADJUSTMENT PROCEDURES

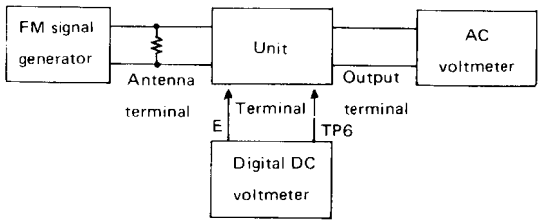
FM SECTION

Item	Step	Connection of instrument	FM SG output	Stereo modulator output	Tuned Frequency	Output indicator	Adjustment point	Adjust	Remarks
Front End	1	Fig. 1			87.9MHz (D) 87.50MHz (G)	Digital DC voltmeter	T2	2.8 ± 0.4V	Usually not necessary to adjust. Repeat the steps 1 & 2 until no further adjustment is necessary.
	2		107.9MHz, 1kHz 75kHz devi. (108.0MHz) (G)		107.9MHz (D) 108.00MHz (G)		TC5	22.1 ± 0.4V	
	3					AC voltmeter	TC1 to TC4	Maximum	
FM IF	1	Fig. 2	99.1MHz, 65dBf 1kHz, 75kHz devi.		99.1MHz	DC voltmeter 1	L104	0V	Set the output volume on back panel to maximum position. IF Band . . . . Wide
	2					AC voltmeter	L106	Maxmimum & 0V	
						DC voltmeter 2			
Signal indicator		Fig. 2	99.1MHz, 25dBf 1kHz, 75kHz devi.		99.1MHz	First L.E.D. of signal indicator	L102	Light on	
V.C.O		Fig. 3	99.1MHz, 65dBf No modulation		99.1MHz	Frequency counter	R205	76kHz ± 50Hz	
Stereo Distortion		Fig. 4	99.1MHz, 65dBf Ext. modulation	1kHz Lch Pilot signal 7.5kHz devi.	99.1MHz	Distortion analyzer	T1 on front end	Minimum	
Stereo Separation		Fig. 4	99.1MHz, 65dBf Ext. modulation	Lch.	99.1MHz	Rch. output	R214	Minimum	IF band: Wide Same and maximum separation
				Rch.		Lch. output		Minimum	
		Fig. 4	99.1MHz, 65dBf Ext. modulation	Lch.	99.1MHz	Rch. output	R215	Minimum	IF band: Narrow Same and maximum separation
				Rch.		Lch. output		Minimum	
Pilot Canceller		Fig. 4	99.1MHz, 65dBf Ext. modulation	Only pilot Signal 7.5kHz devi.	99.1MHz	AC voltmeter	R212	Minimum	
Muting level		Fig. 2	99.1MHz, 17.2dBf		99.1MHz	Oscilloscope	R127	Singal	
			99.1MHz, 16.2dBf					No signal	

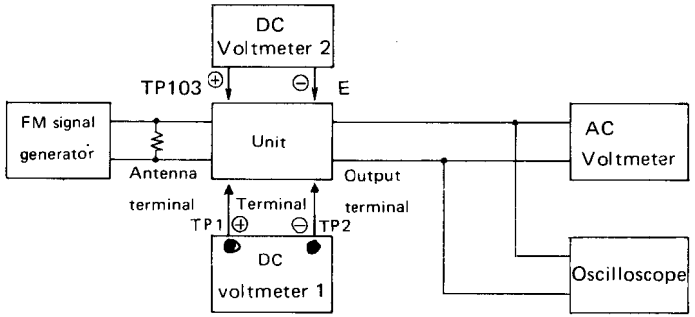
AM Section

10kHz step model

Step	AM SG output	Tuned frequency	Output indicator	Adjust. point	Adjust for	Remarks
1		530 kHz	Digital DC voltmeter	L302	2.0 ± 0.1V	Repeat the steps 1 and 2 until no further adjustment is necessary.
2		1620 kHz		TC302	20 ± 0.1V	
3	600 kHz, 400 Hz 30% mod. 60 dB/m	600 kHz	AC voltmeter	L301	Maximum	Repeat the steps 3 and 4 until no further adjustment is necessary.
4	1400 kHz. 400 Hz 30% mod. 60 dB/m	1400 kHz		TC301	Maximum	
5	1000 kHz, 400 Hz 30% mod. 60 dB/m	1000 kHz	AC voltmeter	X301	Maximum	



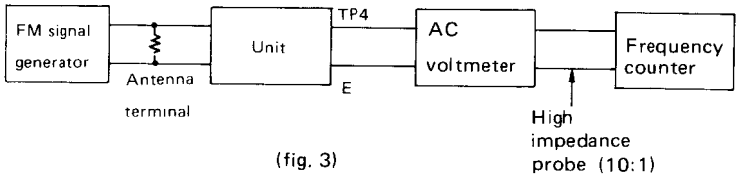
(fig. 1)



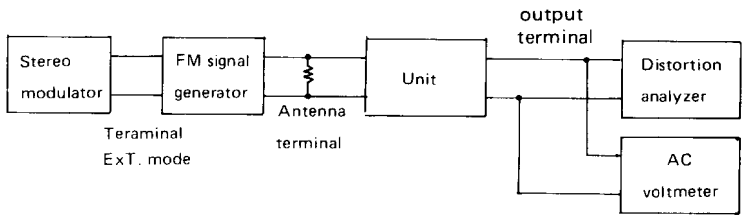
(fig.2)

9kHz step models

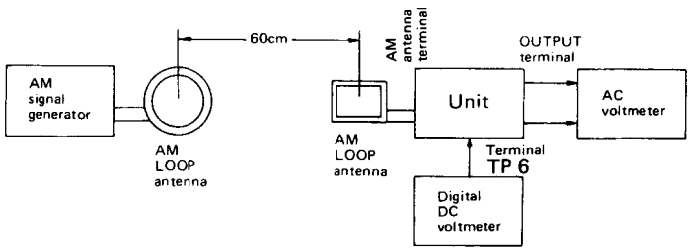
Step	AM SG output	Tuned frequency	Output indicator	Adjust. point	Adjust for	Remarks
1		522 kHz	Digital DC voltmeter	L302	1.8 ± 0.1V	Repeat the steps 1 and 2 until no further adjustment is necessary.
2		1611 kHz		TC302	20 ± 0.1V	
3	603 kHz, 400 Hz 30% mod. 60 dB/m	603 kHz	AC voltmeter	L301	Maximum	Repeat the steps 3 and 4 until no further adjustment is necessary.
4	1404 kHz, 400 Hz 30% mod. 60 dB/m	1404 kHz		TC301	Maximum	
5	999 kHz, 400 Hz 30% mod. 60 dB/m	999 kHz	AC voltmeter	X301	Maximum	

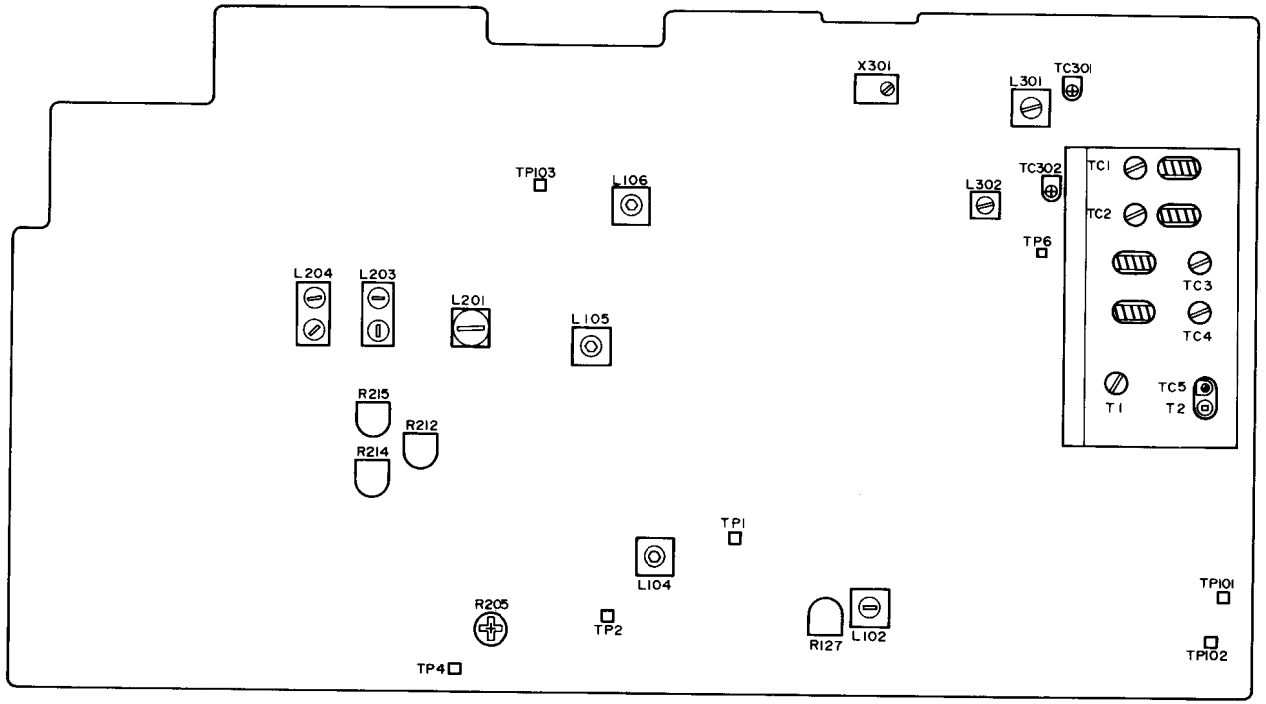


(fig. 3)



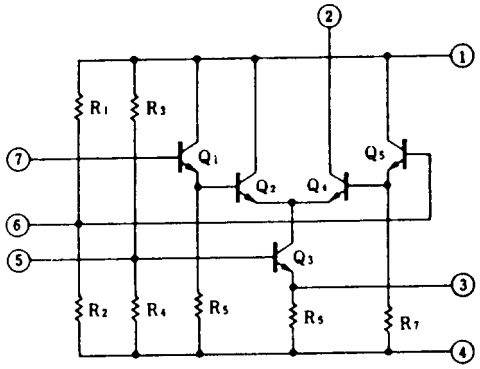
(fig. 4)


60cm
AM antenna terminal
OUTPUT terminal
AM signal generator
AM LOOP antenna
Unit
AC voltmeter
AM LOOP antenna
Terminal TP 6
Digital DC voltmeter


X301
L301
TC301
TP103
L106
TC302
L302
TC1
TC2
TP6
TC3
TC4
L204
L203
L201
L105
TC5
T1
T2
R215
R212
R214
TP1
L104
TP101
R205
TP2
R127
L102
TP102
TP4

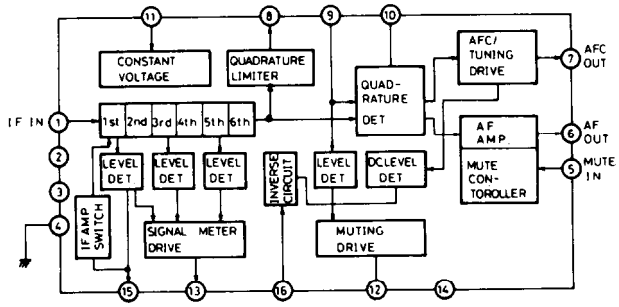
IC BLOCK DIAGRAM

μPC1163H (FM IF amp.)



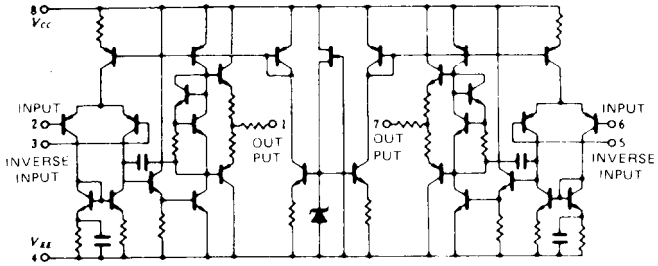
Terminal No.	Operation
1	Vcc
2	OUTPUT
3	BYPASS
4	GND
5	BYPASS
6	INPUT BIAS
7	INPUT

HA-11225(FM IF system)



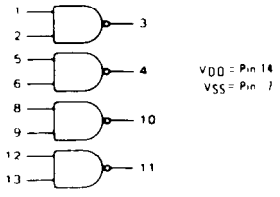
1. IF signal input
2. IF amplifier switch input
   H level: Off
5. Muting switch input
6. Composite signal output
7. AFC output
8. IF amplifier output
9. 10.7MHz input
10. Reference voltage
11. Power supply
12. Muting output
    Tuned: L level
13. Signal strength output
15. AGC out put
16. Muting level

NJM-4558DX/NJM4560D (Operation amplifier)

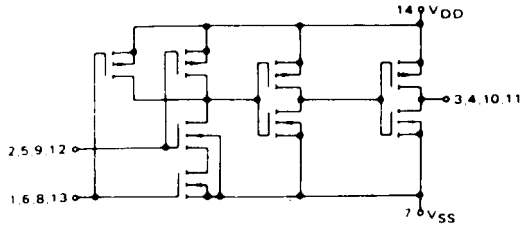


4011B (Nand gate)

LOGIC DIAGRAM

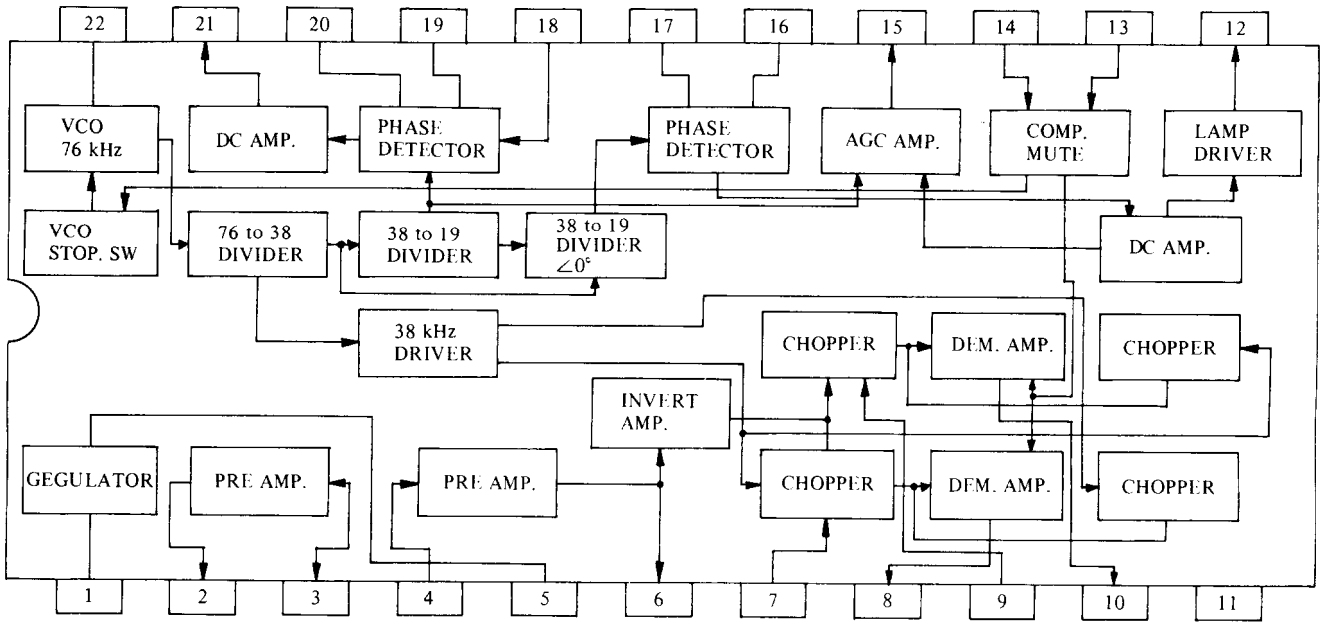


CIRCUIT SCHEMATICS
(1/4 of Device Shown)



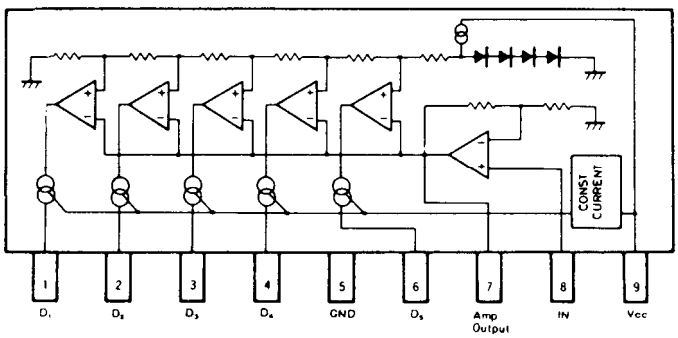
μPC1223C (Stereo decoder)

Block diagram



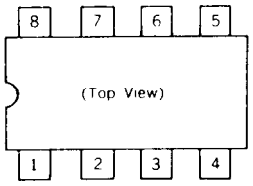
Terminal No.	Connection	Terminal No.	Connection
1	Vcc	12	ST. LAMP INDICATOR
2	PRE AMP. OUTPUT 1	13	ST–MONO SW & VCO STOP
3	PRE AMP. INPUT 1	14	MUTING SWS
4	PRE AMP. INPUT 2	15	19kHz CANCEL
5	BYPASS	16	LPF
6	PRE AMP. OUTPUT 2	17	LPF
7	POST AMP. INPUT	18	FILTER INPUT
8	L–ch OUTPUT	19	LPF
9	POST AMP. INPUT	20	LPF
10	R–ch OUTPUT	21	LPF
11	GND	22	OSC RC NETWORK

LB1403 (Signal strength indicator driver)



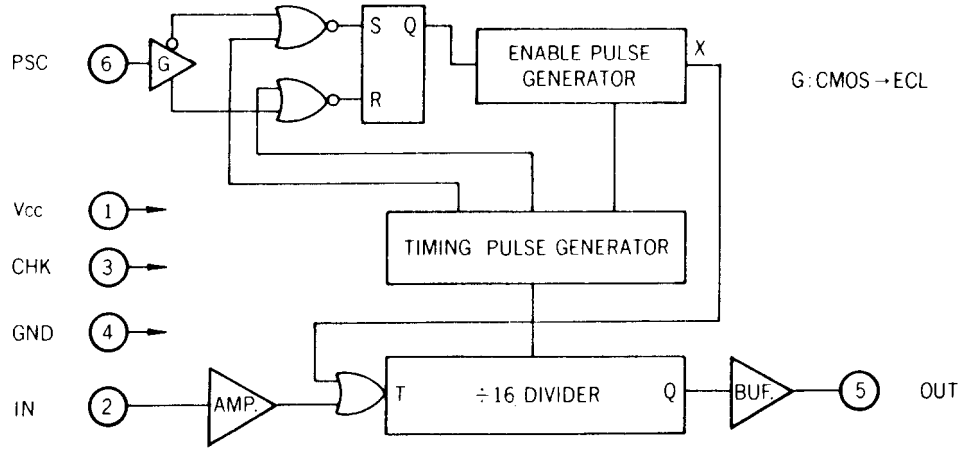
μPB553AC (Prescaler)

Pin Connection

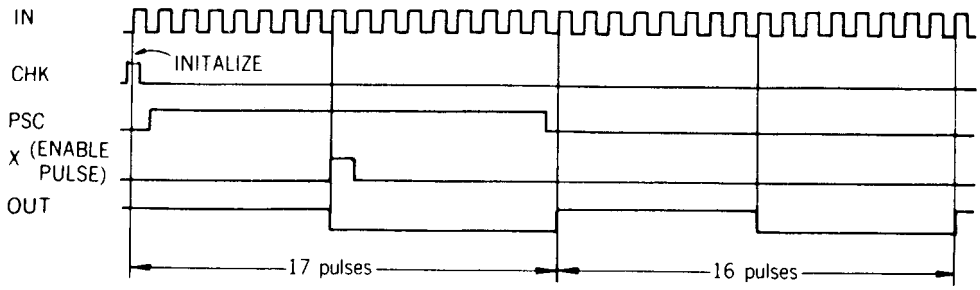


1. Pin 1 (Vcc).....+5 volts Supply
2. Pin 2 (IN).....FM local oscillator signal input
3. Pin 3 (CHK).....Check terminal
4. Pin 4 (GND).....Ground terminal
5. Pin 5 (OUT).....Prescaler terminal
6. Pin 6 (PSC).....Prescaler control terminal
7. Pin 7,8.....Not connected

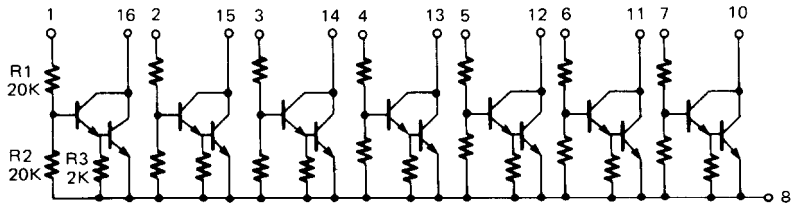
Block Diagram



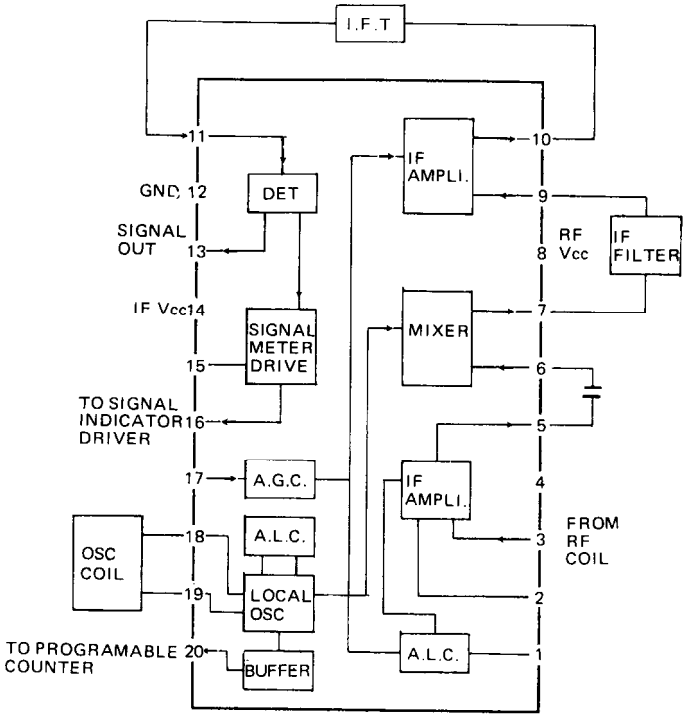
Timing Chart



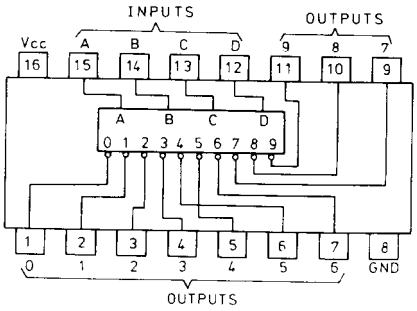
μPA81C (Indicator drive)



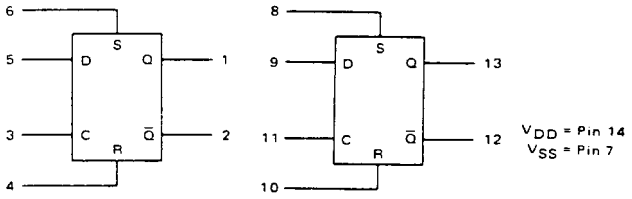
LA-1245 (AM radio system)



74LS42 (BCD to decimal decoder)

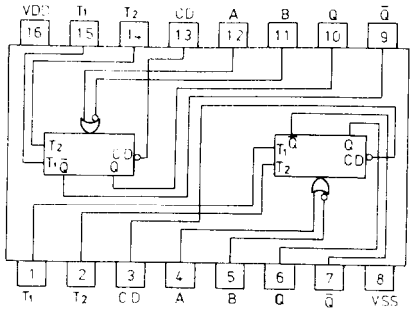


4013 (Dual D Flip-Flop with set/Reset capabitity)



INPUTS				OUTPUTS	
CLOCK†	DATA	RESET	SET	Q	$\bar{Q}$
↑	0	0	0	0	1
↑	1	0	0	1	0
↓	X	0	0	Q	$\bar{Q}$
X	X	1	0	0	1
X	X	0	1	1	0
X	X	1	1	1	1

4538B (Dual precision retriggerable/resettable monostable mulitivibrator)

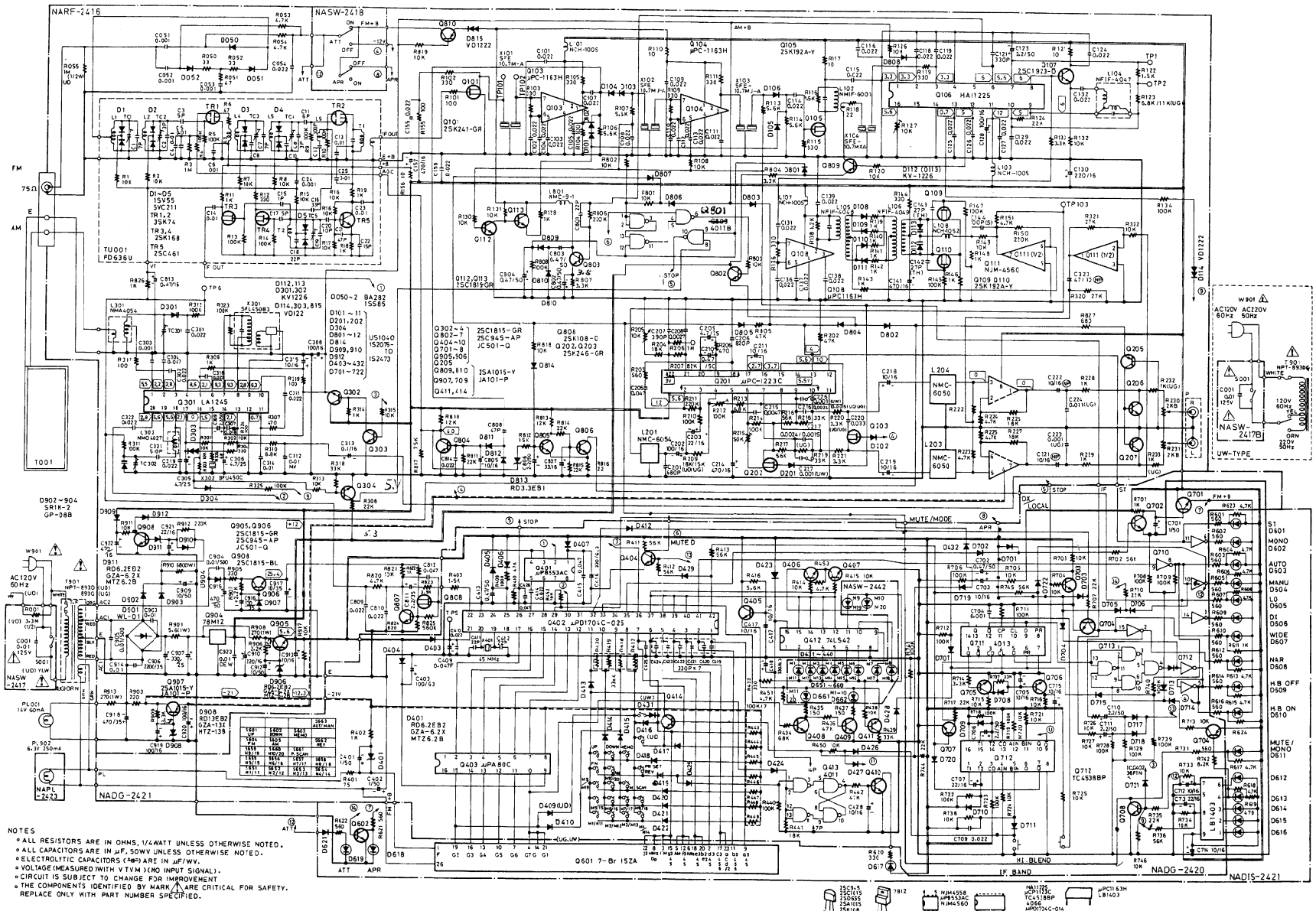


Truth Table

Input			Output	
A	B	CD	Q	$\bar{Q}$
↑	H	H	⊓	⊔
↑	L	H	Q	$\bar{Q}$
H	↓	H	Q	$\bar{Q}$
L	↓	H	⊓	⊔
X	X	L	L	H

X : H or L

SCHEMATIC DIAGRAM



NOTES
- ALL RESISTORS ARE IN OHMS, 1/4WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF, 50WV UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS (◆■) ARE IN μF/WV.
- VOLTAGE (MEASURED WITH VTVM) (NO INPUT SIGNAL).
- CIRCUIT IS SUBJECT TO CHANGE FOR IMPROVEMENT
- THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR SAFETY. REPLACE ONLY WITH PART NUMBER SPECIFIED.

ONKYO CORPORATION

CHANGE OF PARTS

MODEL T-4087

12.Nov.,8

ONKYO CORP.
SERVICE DIVISION

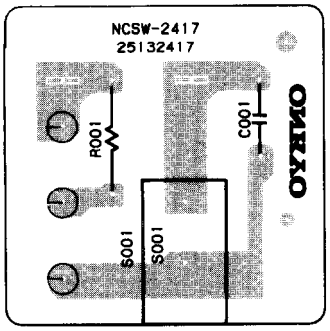
TYPE	CIRCUIT NO.	DESCRIPTION	AFTER CHANGE SPECIFICATIONS	PART NO.	BEFORE CHANGE SPECIFICATIONS	PART NO.	CHANGE DESCRIPTION	APPLI-CATION
NARF-2416	R055	Solid resistor	1MΩ,1/2W	431521055	Add between Ant. terminal & ground.		CSA	
		Label LA		29360168	Add			
NADG-2420	C413 JC701	Elect. capacitor Socket Socket	4.7 μF,25V NSCT-3P-395 NSCT-8P-100	352750479 25050267 25050272	0.47μF,50V NJPS-3P-72 NJPS-8P-77	352784799 25050244 25050249	To stability initialize. Improvement of reliance.	2271-
~~NADG-2420B~~		Socket	NSCT-4P-96	25050268		25050245		
		Label CSA		29360117	Add			1601-

PRINTED CIRCUIT BOARD-PARTS LIST

MAIN CIRCUIT PC BOARD (NARF-2416-1/1A/1B)

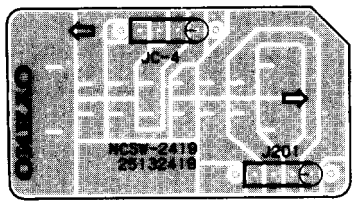
CIRCUIT NO.	PART NO.	DESCRIPTION
	Front end	
TU001	240062	BFD636U12
	ICs	
Q103, Q104	222474	μPC1163H
Q106	222540	HA-11225
Q108	222474	μPC1163H
Q111	222579	NJM4560D
Q201	222732	μPC1223C
Q204	222502	NJM4558DX
Q301	222701	LA1245
Q801	222513 or	TC4011BP or
	222840111	4011BP
Q904	222780122	78M12
	Transistors	
Q101	2212194 or	2SK241 (Y) or
	2212195	2SK241 (GR)
Q105	2212274	2SK192A (Y)
Q107	2211722 or	2SC1923 (R) or
	2211723	2SC1923 (O)
Q109, Q110	2212274	2SK192A (Y)
Q112, Q113	2211255,	2SC1815 (GR),
Q302-Q304	2210746 or	2SC945A (P) or
Q802-Q807	2212485	JC501 (Q)
Q202, Q203	2211944 or	2SK246 (Y) or
	2211945	2SK246 (GR)
Q205, Q809	2211454 or	2SA1015 (Y) or
Q810, Q907	2212494	JA101 (P)
Q206, Q207	2211704,	2SD655 (D),
	2211705 or	2SD655 (E) or
	2211706	2SD655 (F)
Q808	2212294	2SK108 (D)
Q905, Q906	2211255,	2SC1815 (GR),
	2210746 or	2SC945A (P) or
	2212485	JC501 (Q)
Q908	2211256	2SC1815 (BL)
	Diodes	
D050-D052	223165 or	BA282 or
	223149	1SS85
D101-D106	223150,	US1040,
D108-D111	223145 or	1S2076TD or
D201, D202	223124	1S2473
D112, D113	223136	KV1226
D114, D815	4000068	VD1222
D301, D302	223136	KV1226
D303	4000068	VD1222
D304, D814	223150,	US1040,
D801-D812	223145 or	1S2076TD or
	223124	1S2473
D813	2241291	RD3.3EB1
D901	223862	WL-01
D902-D904	223804 or	SR1K-2 or
	223848	GP08B
D906, D911	2239492,	RD6.2EB2,
	2240971 or	GZA-6.2X or
	2243162	MTZ6.2B
D907	2239792	RD27EB2
D908	2239652,	RD13EB2,
	2241131 or	GZA-13X or
	2243242	MTZ-13B
D909, D910	223150,	US1040,
D912	223145 or	1S2076TD or
	223124	1S2473
	Coils	
L101, L103	233105	NCH-1005
L107	233105	NCH-1005
L108	233241	NCH-1052
L201	233350	NMC-6054
L203, L204	233320	NMC-6050
L301	232120	NMA-4054
L302	232110	NMO-4027
L801	233031	NMC-9-1
	Transformers	
L102	233096	NFIF-6001
L104	233295	NFIF-4047
L105	233296	NFIF-4048
L106	233297	NFIF-4049
	Ceramic filters	
X101	3010043	SFE-10.7MM-A
X102, X103	3010087	SFE-10.7MJ-A
X104	3010041	SFE-10.7MX-A
X301	3010075	SFL450B3
X302	3010076	BFU450C
	Capacitors	
C123	352780229	2.2μF, 50V, Elect.
C128	352741019	100μF, 16V, Elect.
C130	352742219	220μF, 16V, Elect.
C141	352744719	470μF, 16V, Elect.
C144	372521014	100pF ±5%, 50V, Styrole
C202	352741019	100μF, 16V, Elect.
C203	352742209	22μF, 16V, Elect.
C206	370138214	820pF ±5%, 100V, APS
C207	370133914	390pF ±5%, 100V, APS
C209	352750479	4.7μF, 25V, Elect.
C210	352784799	0.47μF, 50V, Elect.
C211	352741009	10μF, 16V, Elect.
C214	352744719	470μF, 16V, Elect.
C216, C217	379122424	2,400pF ±5%, 50V, DEW <D>
	379121524	1,500pF ±5%, 50V, DEW <G/W>
C218, C219	352741009	10μF, 16V, Elect.
C221, C222	352941006	10μF, 16V, Non-polar elect.
C223, C224	379121025	1,000pF ± 20%, 50V, DEW
C226, C227	379121024	1,000pF ±5%, 50V, DEW <W>
TC301, TC302	3060010	NTC-20P09, Trimmer
C305, C306	352750479	4.7μF, 25V, Elect.
C308	352741019	100μF, 16V, Elect.
C309	352780229	2.2μF, 50V, Elect.
C313	352781099	0.1μF, 50V, Elect.
C315	352741009	10μF, 16V, Elect.
C321	370135114	510pF ±5%, 100V, APS
C323	352944706	47μF, 16V, Non-polar elect.
C802-C804	352784799	0.47μF, 50V, Elect.
C805	352741009	10μF, 16V, Elect.
C806	352780229	2.2μF, 50V, Elect.
C807	352743309	33μF, 16V, Elect.
C811	395160227	2.2μF, 35V, Tantalum
C813	352784799	0.47μF, 50V, Elect.
C905	384171037	0.01μF, 630V, DT
C906	352762229	2,200μF, 35V, Elect.
C907	352753319	330μF, 25V, Elect.
C909	352781009	10μF, 50V, Elect.
C910	352742219	220μF, 16V, Elect.
C912, C913	352741009	10μF, 16V, Elect.
C915	352784719	470μF, 50V, Elect.
C916	352761019	100μF, 35V, Elect.
C917	352761009	10μF, 35V, Elect.
C918	352764719	470μF, 35V, Elect.

C919	352751019	100μF, 25V, Elect.
C920	352741019	100μF, 16V, Elect.
C921	352742209	22μF, 16V, Elect.
C922	352744719	470μF, 16V, Elect.
C923	379121045	0.1μF ±10%, 50V, DEW
	Resistors	
R127	5215045	N08HR10KBC, Semi-fixed
R205	5225015	N10HR10KBD, Semi-fixed
R212	5215047	N08HR100KBC, Semi-fixed
R214	5215047	N08HR100KBC, Semi-fixed
R215	5215046	N08HR50KBC, Semi-fixed
R230	5146046	N16RGL2KB15, Output level variable
R901	441620564	5.6Ω, 1W, Metal oxide film
R908	441622714	270Ω, 1W, Metal oxide film
R910	441626814	680Ω, 1W, Metal oxide film
R913	441622714	270Ω, 1W, Metal oxide film
	Terminals	
	25060087	NT-2PDMN31, Antenna
	25045141	NPJ-2PDBL54, Output
	Radiator	
	27160179	RAD-057
	Screw	
	82143006	3P+6FN (BC), Pan head



POWER SWITCH PC BOARD

APR/ATT. SWITCH PC BOARD



BAND/EMHASIS SWITCH PC BOARD

POWER SWITCH PC BOARD (NASW-2417-1/1A)

CIRCUIT NO.		PART NO.	DESCRIPTION
C001	⚠	3500065A	DE7150FZ103PAC400V/ 125V, Capacitor 1S
R001	⚠	431523355	3.3MΩ, 1/2W, Resistor, solid <D>
S001	⚠	25035295	NPS-111-L261P, Power switch

APR/ATT. SWITCH PC BOARD (NASW-2418-1)

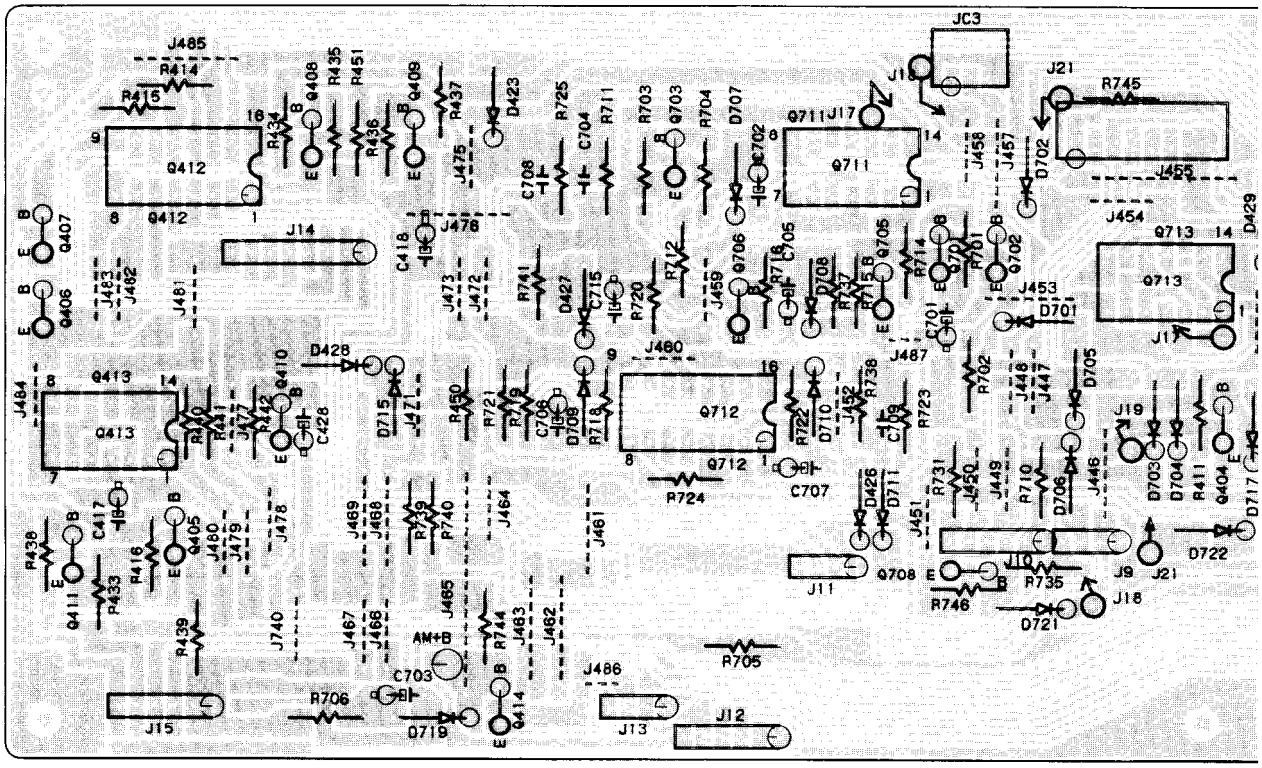
CIRCUIT NO.	PART NO.	DESCRIPTION
S004, S005	25035494	NPS-222-L456, Push switches

BAND/EMPHASIS SWITCH PC BOARD (NASW-2419-1) <Only Universal model>

CIRCUIT NO.	PART NO.	DESCRIPTION
S003	25065240	NSS-42102, Slide switch

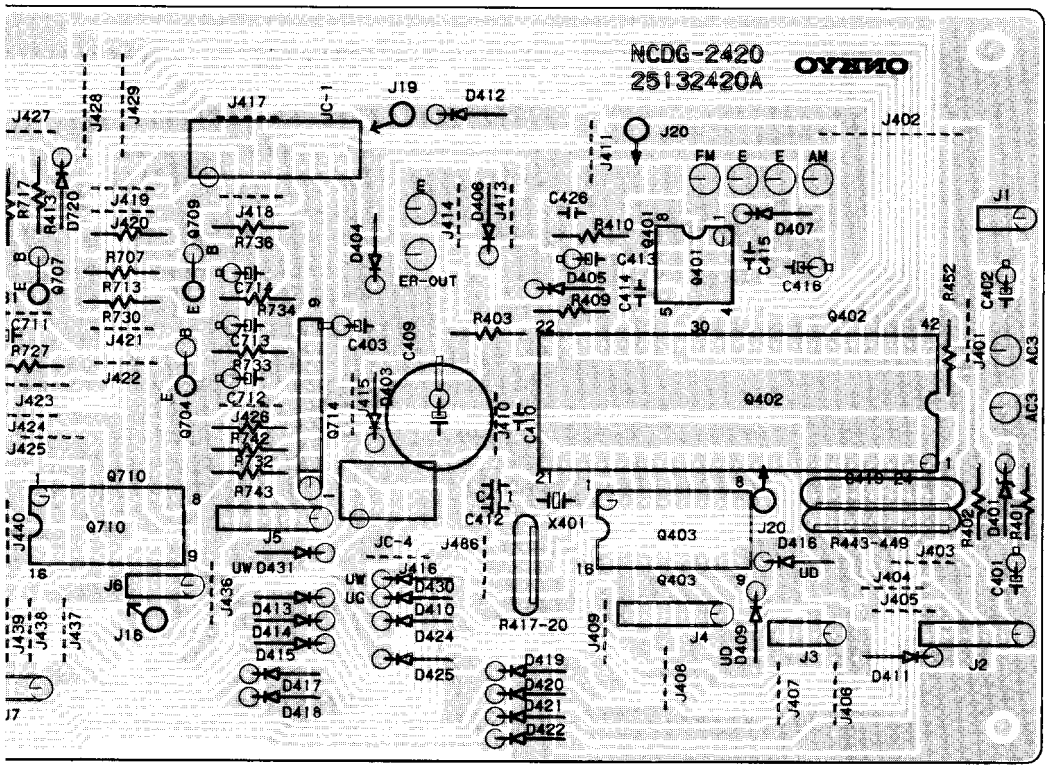
NOTE: THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PARTS NUMBER SPECIFIED.

PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE

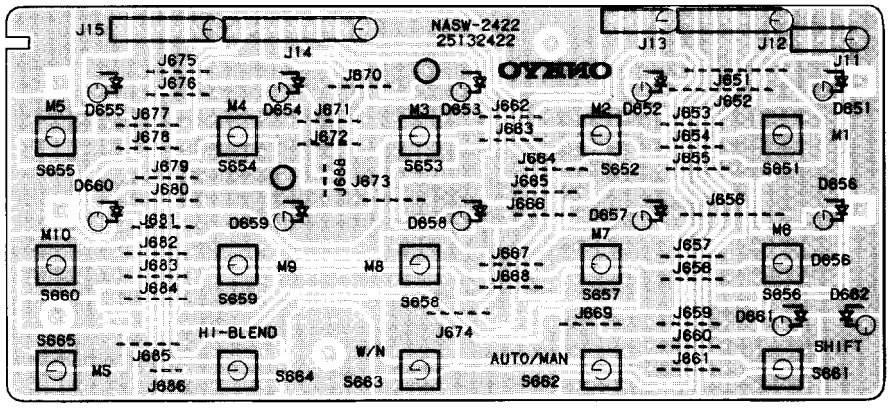


DIGITAL CIRCUIT PC BOARD (NADG-2420-1/1A/1B)

CIRCUIT NO.	PART NO.	DESCRIPTION
	ICs	
Q401	222619	μPB553AC
Q402	222763	μPD1704C-025
Q403	222801	μPA80C
Q412	222740421	74LS42
Q413, Q713	222513 or	μPD4011BP or
	222840111	4011BP
Q710	222807	μPA81C
Q711	222840131	4013B
Q712	222850381	4538B
Q714	222670 or	BA6124 or
	222666	LB1403
	Transistors	
Q404-Q410	2211255,	2SC1815 (GR),
Q701-Q708	2210746 or	2SC945A (P) or
	2212485	JC501 (Q)
Q414, Q710	2211454 or	2SA1015 (Y) or
Q411, Q709	2212494	JA101 (P)
	Diodes	
D401	2240971 or	GZA-6.2X or
	2239492	RD6.2EB2
D403-D407	223150,	US1040,
D412-D415	223145 or	1S2076TD or
D417-D429	223124	1S2473
D409, D416	223150,	US1040,
	223145 or	1S2076TD or
	223124	1S2473 <D>
D410	223150,	US1040,
	223145 or	1S2076TD or
	223124	1S2473 <G>
D430, D431	223150,	US1040,
	223145 or	1S2076TD or
	223124	1S2473 <W>
D432, D722	223150,	US1040,
D701-D715	223145 or	1S2076TD or
D717-D720	223124	1S2473
D721	223132	1K60
	X' tal	
X401	3010091	XTL-4.5M
	Capacitors	
C401, C402	352780109	1μF, 50V, Elect.
C403	352721019	100μF, 6.3V, Elect.
C409	3020018	0.047F, 5V, Super
C416	352723319	330μF, 6.3V, Elect.
C417	352741009	10μF, 16V, Elect.
C418	352723319	330μF, 6.3V, Elect.
C419-C424	3020024	B8×C0116-32N, Block
C428	352741009	10μF, 16V, Elect.
C701	352780109	1μF, 50V, Elect.
C702	352784799	0.47μF, 50V, Elect.
C703, C705	352741009	10μF, 16V, Elect.
C706	352780229	2.2μF, 50V, Elect.
C707	352742209	22μF, 16V, Elect.
C710, C711	352780229	2.2μF, 50V, Elect.
C712	352741009	10μF, 16V, Elect.
C713	352742209	22μF, 16V, Elect.
C714, C715	352741009	10μF, 16V, Elect.
	Resistors	
R417-R420	49121333504	33kΩ×4, 1/8W, Network
R443-R449	49121104507	100kΩ×7, 1/8W, Network
	Sockets	
JC701	25050244	NJPS-3P-72
JC702	25050249	NJPS-8P-77
	25050245	NJPS-4P-73 (W)



DIGITAL CIRCUIT PC BOARD



MEMORY SWITCH PC BOARD

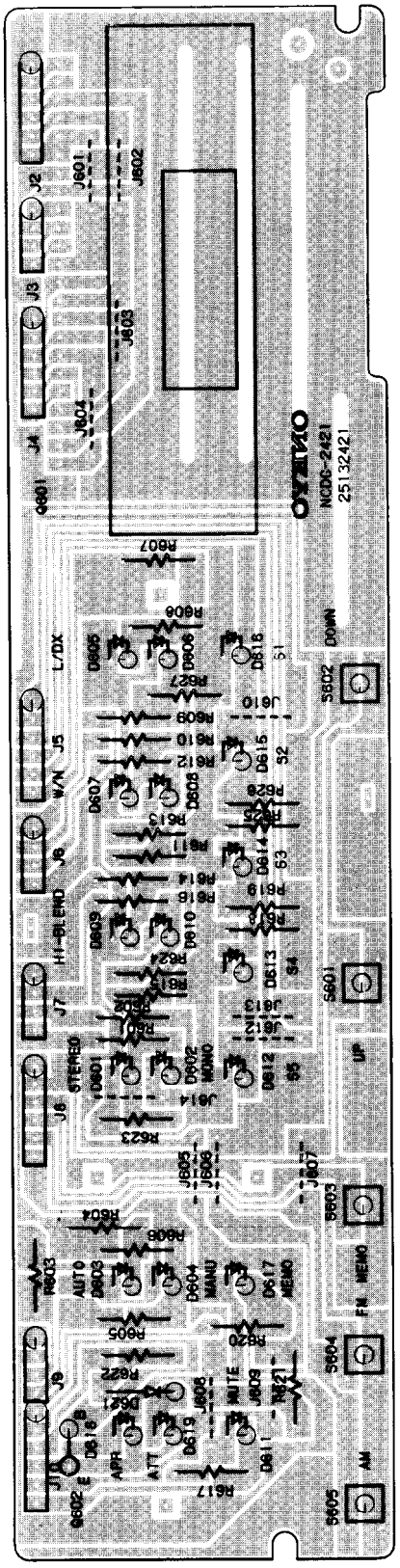
MEMORY SWITCH PC BOARD (NASW-2422-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
	L. E. Ds	
D651-D660	225141	SEL2213C
D661	225137CG, 225137DG or 225137DY	SEL2413E-CG, SEL2413E-DG or SEL2413E-DY
D662	225142	SEL2913K
	Switches	
S651-S665	20535389	NPS-111-S353
	Holders	
	27190355A	LED 5
	27190249	LED

LAMP PC BOARD (NAPL-2423-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
PL902	210064A	PL6.3V, 250mA

PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE

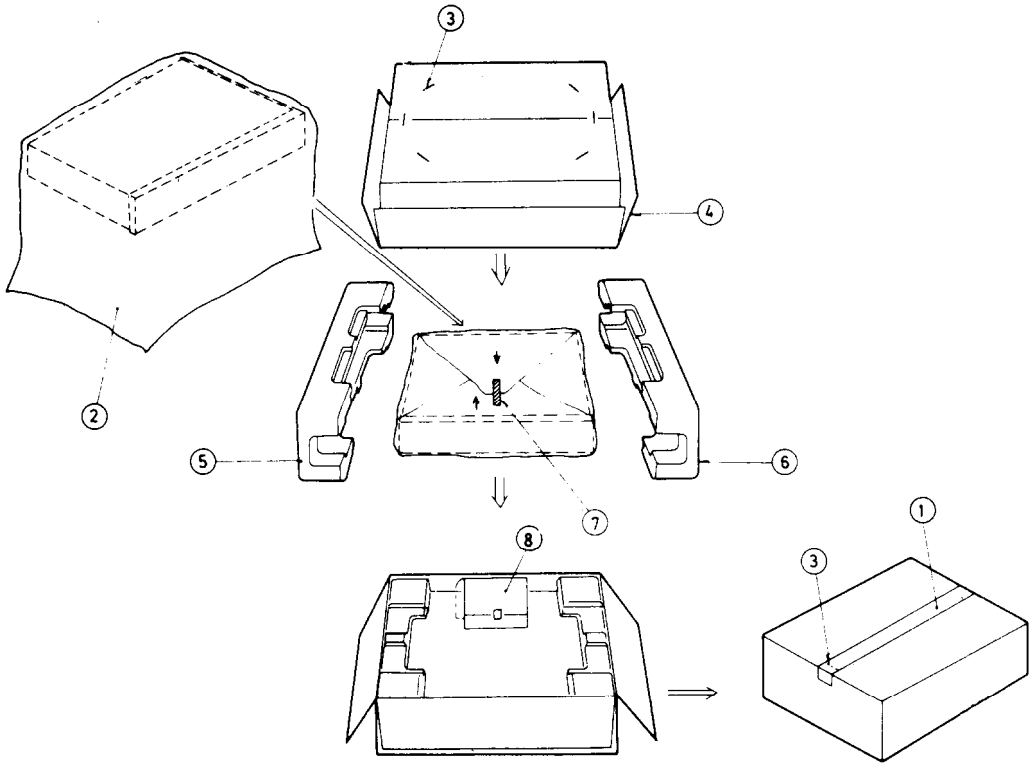


DISPLAY CIRCUIT
PC BOARD

DISPLAY CIRCUIT PC BOARD (NADG-2421-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
	Fluorescent indicator tube	
Q601	212018	7-BT-15ZA
	Transistor	
Q602	2211255, 2210746 or 2212485	2SC1815 (GR), 2SC945A (P) or JC501 (Q)
	L. E. Ds	
D601, D617	225141	SEL2213C
D602, D606	225142	SEL2913K
D608, D610	225142	SLE2913K
D619, D604	225142	SEL2913K
D603, D605	225137CG,	SEL2413E-CG,
D607, D609	225137DG or	SEL2413E-DG or
D611-D616	225137DY	SEL2413E-DY
D618		
	Diode	
D621	223150, 223145 or 223124	US1040, 1S2076TD or 1S2473
	Switches	
S601-S605	25035389	NPS-111-S353
	Holder	
	27190404	L. E. D
	Cushion	
	28140597	1.5 x 10 x 40mm

PACKING VIEW



REF. NO.	PART NO.	DESCRIPTION
1	29095012-1	500x800mm, Protection sheet
	29095318	500x800mm, Protection sheet (U.S.A model)
2	29100036A	550x850mm, Poly-vinyl bag
3	282301	Sealing hook
4	29051200	Master carton box
	29051201	Master carton box (black model)
	29051243	Master carton box (U.S.A. model)
5	29090772A	Pad R
6	29090771A	Pad L
7	29110032	Adhesive tape
8	260012	50x700mm, Damplon tape
	Accessary bag complete	
	U. S. A. model	
	292092	FM antenna
	29340932	Instruction manual
	2010095	Connection cable
	25060088	FM adaptor
	29365006-7	Warranty card
	29358002C	Service station list

PART NO.	DESCRIPTION
120V model	
292092	FM antenna
2010095	Connection cable
25060088	FM adaptor
29340932	Instruction manual
220V model	
292092	FM antenna
2010095	Connection cable
25060088	FM adaptor
29340933	Instruction manual
120/220V model	
292092	FM antenna
2010095	Connection cable
25060088	FM adaptor
29340933	Instruction manual
25055040	CV-K-2, Conversion plug

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